REMARKS

By the present amendment and response, claims 1, 3, 9, and 16 have been amended to overcome the Examiner's objections and claim 2 has been canceled. Thus, claims 1 and 3-20 remain in the present application. Reconsideration and allowance of outstanding claims 1 and 3-20 in view of the above amendments and the following remarks are respectfully requested.

A. Rejections of Claims 1-4, 6-13, 15-17, and 19-20 under 35 USC §103(a)

The Examiner has rejected claims 1-4, 6-13, 15-17, and 19-20 under 35 USC §103(a) as being obvious over U.S. Patent Number 5,399,903 to Rostoker, et al. ("Rostoker") in view of U.S. Patent Number 6,614,122 to Dory, et al. ("Dory"). For the reasons discussed below, Applicants respectfully submit that the present invention, as defined by amended independent claims 1, 9, and 16, is patentably distinguishable over the cited references.

As disclosed in the present application, a surface mount component is situated over a substrate. The surface mount component has first and second terminals. First and second pads are situated on the substrate and are coupled to the first and second terminals, respectively. As part of the solution to conventional technology, solder mask trench 124 is formed under a surface mount component ("SMC") (such as SMC 102 or SMC 302), although the region under the SMC is not generally solderable wherein, in any event, no soldering is to take place. Thus, solder mask trench 124 is formed where, in the absence

of the present invention, no solder mask opening would be formed. Indeed, since the invention does not require complex changes to the existing technology, the disadvantages of the existing technology in having voids in molding compounds under an SMC are overcome without increasing manufacturing costs. Thus, as a part of the teachings of the present invention, a solder mask trench is formed under the SMC and the trench and the related moldable gap are filled with a molding compound.

More particularly, as shown in for example Figure 1 of the present application, solder mask trench 124 is formed within, i.e. between portions of, solder mask 112. By forming solder mask trench 124 underneath the surface mount component and within solder mask 112, moldable gap 125 is advantageously formed to be substantially larger than a conventional moldable gap. By contrast, in a conventional structure, solder mask 112 would extend between pads 106 and 108 underneath the surface mount component. As a result, a conventional moldable gap that would be formed between solder mask 112 and the bottom surface of the surface mount component would have height 130, as shown in Figure 1 of the present application.

However, by forming solder mask 124 within, i.e. between portions of, solder mask 112, embodiments according to the present invention advantageously achieve a significantly larger moldable gap, having height 128, that improves molding compound flow underneath the surface mount component and, consequently, minimizes void formation underneath the surface mount component. As a result, embodiments according to the present invention advantageously minimize the risk of shorting between the

terminals of the surface mount component during, for example, reflow assembly. Thus, the reliability of the surface mount component is significantly increased.

The Examiner states that the present invention is obvious over Rostoker in view of Dory, notwithstanding that Rostoker does not disclose "a solder mask trench formed within a solder mask," as recited in amended independent claims 1, 9 and 16 and that no motivation or suggestion to modify Rostoker can be found in either Rostoker or Dory. A modification is deemed obvious when the cited art suggests the desirability of the modification. As stated by the Federal Circuit:

> "The mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious *unless the prior art suggested the desirability of the modification*" (emphasis added). *In re Gordon,* 733 F.2d 900, 902 (Fed. Cir. 1984) (*see also In re Fitch,* 972 F.2d 1260 (Fed. Cir. 1992)).

Therefore, the desirability to modify Rostoker must be found within either Rostoker or Dory. As acknowledged by the Examiner, Rostoker does not disclose "a solder mask trench formed within a solder mask" as required by amended independent claims 1, 9 and 16 of the present invention. Moreover, Rostoker does not suggest the deliberate use of a trench formed within a solder mask to facilitate the flow of molding compound underneath a surface mount component as claimed by amended independent claims 1, 9 and 16. This is because the disclosure in Rostoker, as seen in Figure 6 and column 9, lines 28-50, is limited to filling an "opening" underneath die 152 that is formed between the conductive traces 148A and 148B. See, for example, column 9, lines 41-45.

Thus, a trench in a solder mask is not taught, disclosed, or suggested by Rostoker. Indeed, the phrase "solder mask" does not appear anywhere in Rostoker.

Moreover, Dory discloses a structure to trap or restrict the flow of underfill material to keep it away from a microchip. More particularly, in reference to Figures 2A, 2B, and 2C of Dory, Dory describes two barriers 202, each made with three barrier elements; a trench barrier element 208, and two dams 210, 212 each constructed from silk-screen ink. The second dam 210 has a trench 218 laser etched into a top surface of the dam 212. The barriers 202 restrict flow of underfill material 204 and, as a result, allow for the placement of passive component lands 216 closer to the die 213. See, column 2, line 60 through column 3, line 1. In this manner, Dory reaches its stated purpose of a "structure and method for providing a barrier to restrict flow at assembly of an underfill material dispensed between a microchip and a substrate." Column 2, lines 11-15.

Thus, Dory does not teach, disclose or suggest either creating or filling an enlarged moldable gap in a solder mask trench under an SMC as disclosed and claimed by the present invention. The claims of the present application have been amended to call for a moldable gap which includes a solder mask trench, where the moldable gap and the solder mask trench facilitate the flow of the molding compound underneath the surface mount component, and where the solder mask trench is filled with the molding compound. The amended claims thus further patentably distinguish the present invention over Rostoker or Dory, or any combination thereof.

For the foregoing reasons, Applicants respectfully submit that the present invention as defined by amended independent claims 1, 9, and 16 is not taught, disclosed, or suggested by the art of record. As such, the claims depending from independent claims 1, 9, and 16 are, *a fortiori*, also patentable for at least the reasons presented above and also for additional limitations contained in each dependent claim.

B. Rejections of Claims 5, 14, and 18 under 35 USC §103(a)

The Examiner has rejected claims 5, 14, and 18 under 35 USC §103(a) as being obvious over Rostoker in view of Dory, and further in view of U.S. Patent Number 5,969,461 to Anderson, et al. ("Anderson"). Applicant respectfully submits that claims 5, 14, and 18 depend from amended independent claims 1, 9, and 16, respectively, and thus, claims 5, 14, and 18 should be allowed at least for the same reasons discussed above in conjunction with patentability of independent claims 1, 9, and 16.

C. Conclusion

Based on the foregoing reasons, the present invention, as defined by amended independent claims 1, 9, and 16, and the claims depending therefrom, is patentably distinguishable over the cited art. Thus, outstanding claims 1 and 3-20 are patentably distinguishable over the cited art. As such, and for all the foregoing reasons, an early Notice of Allowance directed to all claims 1 and 3-20 remaining in the present application is respectfully requested.

Application Serial No.: 10/623,243
Attorney Docket No.: 0140111

Respectfully Submitted,
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Date: 1/28/05

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